2008-07

N 536 - Utilization of Nursing Research in Advanced Practice, Summer 2008

Tzeng, Huey-Ming

http://hdl.handle.net/2027.42/64943
Research Design

Contributors
Sonia A. Duffy, PhD, RN
Lisa Kane Low, PhD, CNM, FACNM
Huey-Ming Tzeng, PhD, RN
Design Characteristics

- Maximizes control over factors to increase the validity of the findings
- Guides the researcher in planning and implementing a study
Level of Control: Quantitative Research

- Descriptive
- Correlational
- Quasi-experimental
- Experimental

Increased Control with Design
Concepts Relevant to Research Design (1)

**Causality**

A \[\rightarrow\] B
Pressure \[\rightarrow\] Ulcer

**Multicausality**

Years smoking \[\rightarrow\] Heart disease
High fat diet \[\rightarrow\] Heart disease
Limited exercise \[\rightarrow\] Heart disease
Concepts Relevant to Research Design (2)

- Probability: Likelihood of an outcome
- Bias: Slanting findings
- Manipulation: Treatment
- Control: All phases of design
Design Validity

• Measure of accuracy of a study

• Examined with critique of the following dimensions:
  o Statistical conclusion validity
  o Internal validity
  o Construct validity
  o External validity
Elements of a Strong Research Design (1)

- Controlling the environment of the study setting

  - Levels of controlling:
    - Natural setting
    - Partially controlled setting: e.g., clinics
    - Highly controlled setting: e.g., laboratory
Elements of a Strong Research Design (2)

- Controlling the equivalence of subjects and groups
  - Random subject selection
  - Random assignment to groups
Elements of a Strong Research Design (3)

- Controlling the treatment
  - Choose a treatment based on research and practice
  - Develop a protocol for implementation
  - Document the implemented treatment
  - Use a check-list to determine the extent of completeness to which the treatment was implemented
  - Evaluate the treatment during the study
Elements of a Strong Research Design (4)

- Controlling measurement
  - Reliability
  - Validity
  - Number of measurement methods
  - Types of instruments
Elements of a Strong Research Design (5)

- **Controlling extraneous variables**
  - Identify and eliminate extraneous variables via sample criteria, choice of settings, or research design
  - Random sampling
  - Sample: Heterogenous, homogeneous, or matching
  - Statistical control
Problems with Study Designs

- Inappropriate for the study purpose or the research framework
- Poorly developed designs
- The research methods were poorly implemented
- Inadequate treatment, sample, or measurement methods
Selecting a Design

Is there a treatment?

No

Is the primary purpose examination of relationships?

No

Is the treatment tightly controlled by the researcher?

No

Descriptive Design

Will the sample be studied as a single group?

No

Quasi-Experimental Study

Will a randomly assigned control group be used?

No

Is the original sample randomly selected?

No

Correlational Design

Experimental Study

Yes
Selecting a Descriptive Design

Examining sequences across time?

- No
  - One Group?
    - No
      - Comparative Descriptive Design
    - Yes
      - Descriptive Design

- Yes
  - Following same subjects across time?
    - No
      - Data collected across time
    - Yes
      - Single unit of study

  - Studying events partitioned across time?
    - No
      - Cross-sectional design
    - Yes
      - Longitudinal Study

  - Repeated measures of each subject
    - Yes
      - Trend Analysis
    - No
      - Longitudinal design with treatment partitioning
A Typical Descriptive Design

Clarification ➔ Measurement ➔ Description ➔ Interpretation

Phenomenon of Interest

Variable 1 ➔ Description of Variable 1
Variable 2 ➔ Description of Variable 2
Variable 3 ➔ Description of Variable 3
Variable 4 ➔ Description of Variable 4

Interpretation of Meaning ➔ Development of Hypotheses
A Comparative Descriptive Design

Group I {variables measured} → Describe → Comparison of Groups on Selected Variables → Interpretation of Meaning → Development of Hypotheses

Group II {variables measured} → Describe
Selecting the Type of Correlational Design

- Describe relationships between/among variables?
  - Descriptive correlational design

- Predict relationships between/among variables?
  - Predictive correlational design

- Test theoretically proposed Relationships?
  - Model testing design
A Descriptive Correlational Design

Measurement

Research Variable 1

Description of variable

Examination of Relationship

Interpretation of Meaning

Development of Hypotheses

Research Variable 2

Description of variable
A Predictive Design

Value of Intercept + Value of Independent Variable 1 + Value of Independent Variable 2 = Predicted Value of Dependent Variable
Selecting The Type of Quasi-Experimental Design

Control Group?
- No
  - Pretest?
    - No
      - One-group post-test only design
    - Yes
      - Repeated Measures?
        - No
          - Strategy for Comparison
            - No
              - Suggest Reevaluating design
            - Yes
              - One group pretest/post-test design
        - Yes
          - Compare treatment & control conditions?
            - No
              - Suggest Reevaluating design
            - Yes
              - One group pretest/post-test design
- Yes
  - Pretest?
    - No
      - Comparison with population values?
    - Yes
      - Repeated Measures?
        - No
          - Strategy for Comparison
            - No
              - Suggest Reevaluating design
            - Yes
              - One group pretest/post-test design
        - Yes
          - Compare treatment & control conditions?
Selecting The Type of Experimental Design

Pretest

No

Post-test only control group design

Yes

Repeated Measurements?

No

Examine effects of confounding variables?

No

Multiple sites?

Pretest/post-test control group design

Yes

Repeated measures design

Examine effects of confounding variables?

No

Multiple sites?

Pretest/post-test control group design

Yes

Repeated measures design

Blocking?

No

Comparison of multiple levels of treatment

Pretest/post-test control group design

Yes

Randomized Block Design

Comparison of multiple levels of treatment

No

Examining of complex relationships among variables in relation to treatment

Yes

Nested Designs
## Pretest-Post Test, Control Group Designs

<table>
<thead>
<tr>
<th></th>
<th>Measurement of dependent variables</th>
<th>Manipulation of independent variables</th>
<th>Measurement of dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Randomly selected experimental group</td>
<td>PRETEST</td>
<td>TREATMENT</td>
<td>POST-TEST</td>
</tr>
<tr>
<td>Randomly selected control group</td>
<td>PRETEST</td>
<td></td>
<td>POST-TEST</td>
</tr>
</tbody>
</table>

### Treatment:
Under control of researcher

### Findings:
- Comparison of pretest and post-test scores
- Comparison of experimental and control groups
- Comparison of pretest-post-test differences between samples

### Example:
Your self (1990). The impact of group reminiscence counseling on a depressed elderly population.

### Uncontrolled threats to validity:
- Testing
- Mortality

### Instrumentation
- Restricted generalizability as control increases
### Post-Test-Only Control Group Design

<table>
<thead>
<tr>
<th>Randomly selected experimental group</th>
<th>Randomly selected control group</th>
<th>Treatment:</th>
<th>Findings:</th>
<th>Example:</th>
<th>Uncontrolled threats to validity:</th>
</tr>
</thead>
</table>

**Measurement of independent variables**

**Measurement of dependent variables**

- TREATMENT
- POST-TEST
### Pain Control Management

<table>
<thead>
<tr>
<th>Traditional care</th>
<th>PRN Medication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td>Unit A</td>
</tr>
<tr>
<td>Unit B</td>
<td>Unit B</td>
</tr>
<tr>
<td>Unit C</td>
<td>Unit C</td>
</tr>
<tr>
<td>Unit D</td>
<td>Unit D</td>
</tr>
<tr>
<td>Unit E</td>
<td>Unit E</td>
</tr>
<tr>
<td>Unit F</td>
<td>Unit F</td>
</tr>
<tr>
<td>Unit G</td>
<td>Unit G</td>
</tr>
<tr>
<td>Unit H</td>
<td>Unit H</td>
</tr>
</tbody>
</table>

#### Primary Nursing Care

<table>
<thead>
<tr>
<th>Primary Care</th>
<th>No Primary Care</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit A</td>
<td>Unit A</td>
</tr>
<tr>
<td>Unit B</td>
<td>Unit B</td>
</tr>
<tr>
<td>Unit C</td>
<td>Unit C</td>
</tr>
<tr>
<td>Unit D</td>
<td>Unit D</td>
</tr>
<tr>
<td>Unit E</td>
<td>Unit E</td>
</tr>
<tr>
<td>Unit F</td>
<td>Unit F</td>
</tr>
<tr>
<td>Unit G</td>
<td>Unit G</td>
</tr>
<tr>
<td>Unit H</td>
<td>Unit H</td>
</tr>
</tbody>
</table>

#### New approach: “Around the clock” medication
Advantages of Experimental Designs

- More controls in design and conducting a study
- Increased internally validity
  - Decreased threats to design validity
- Fewer rival hypotheses
Advantages of Quasi-Experimental Designs

- More practical
  - Ease of implementation
- More feasible
  - Resources, subjects, time, setting
- More generalizable
  - Comparable to practice
Developing the Design Section of Your Proposal

- Identify the design
  - Name it specifically
- Provide a map of the design
- Discuss your rationale for using this design
- Describe threats to the validity of the chosen design